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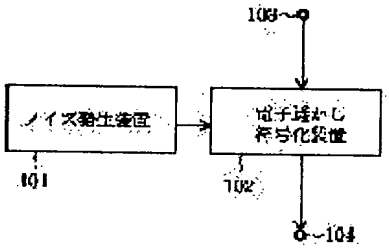
(54) METHOD AND DEVICE FOR PREVENTING ILLICIT COPY

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent an illicit copy by burying an electronic watermark to enlarge the cost for illicit copy in the data and adding randomness to the data.
SOLUTION: When a sound/image signal is copied (recorded), beforehand this device is integrated in a sound/image signal reproducing/recording device, and the reproduced sound/image signal is supplied to an input terminal 103, and a noise of an extent that a viewer can't recognize deterioration in sound quality and picture quality is buried in the sound/image signal, and is outputted from this output terminal 104, and this signal is copied (recorded). A TV set and a video recorder, etc., are connected to this output terminal 104, and when the viewer views this output as it is, the viewer doesn't feel inconvenience. However, when someone tries to copy this output illicitly, since the noise is superimposed further on the sound/image signal, the second quality and picture quality are deteriorated further, and the viewer becomes to feel the inconvenience, and an advantage performing the illicit copy is eliminated.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The unjust copy prevention technique characterized by embedding the noise which is the grade which a degradation of tone quality or quality of image can hardly recognize to the reproduced sound signal or picture signal at a televiewer as digital watermarking.
[Claim 2] The unjust copy arrester of voice or a picture signal equipped with a digital-watermarking coding means to embed and output the noise which the decode means of a sound signal or a picture signal, a noise occurrence means, and the aforementioned noise occurrence means output as digital watermarking to the sound signal or picture signal which the aforementioned decode means outputs.
[Claim 3] The regeneration recording device of the voice or the picture image which reproduces or records the sound signal or picture signal where is equipped with an unjust copy arrester according to claim 2, and the aforementioned noise was embedded.
[Claim 4] The unjust copy prevention control signal which directs to embed a noise as digital watermarking at the time of regeneration record of a sound signal or a picture signal is embedded as digital watermarking at the aforementioned sound signal or a picture signal. When the aforementioned unjust copy prevention control signal is detected out of the sound signal which decoded at the time of regeneration record of a sound signal or a picture signal, or a picture signal and the aforementioned unjust copy prevention control signal is detected The unjust copy prevention technique characterized by embedding the noise which is the grade which a degradation of tone quality or quality of image can hardly recognize to a sound signal or a picture signal at a televiewer as digital watermarking at the time of regeneration record.
[Claim 5] A decryption means to extract the unjust copy prevention control signal which directs to embed a noise as digital watermarking at the time of regeneration record from the inputted sound signal or a picture signal, A comparison means to compare the unjust copy prevention control signal beforehand given the aforementioned unjust copy control signal extracted with this decryption means, and self-equipment, A noise occurrence means and the digital-watermarking coding means which embeds the noise which the aforementioned noise occurrence means outputs as digital watermarking of the grade a televiewer cannot recognize a degradation of the tone quality or quality of image to be, It is the unjust copy arrester characterized by having a selection means to output the output of the aforementioned digital-watermarking coding means when the aforementioned comparison means detects a correspondence of an unjust copy prevention control signal, and to output the sound signal or picture signal inputted when an inequality was detected.
[Claim 6] The regeneration recording device of the voice or the picture image as which the sound signal or picture signal where the unjust copy prevention control signal was set in the type where it is the regeneration recording device of the voice or the picture image reproduced or recorded, and a user cannot change beforehand voice or a picture image equipped with the unjust copy arrester according to claim 5 into a device, and the unjust copy prevention control signal was beforehand embedded as digital watermarking is inputted.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the technique and equipment for preventing that the recorded data are copied unjustly in the regeneration recording device of a sound signal or a picture signal. Being set as the object of this invention expresses a meaning called a sound signal or a picture signal in one word of a voice picture signal below, although it is the combination of the both sides of either a sound signal or a picture signal a sound signal, and a picture signal.
[0002]
[Description of the Prior Art] The technique of taking out the embedded data from the voice where excessive data are embedded and this excessive data was embedded, or a picture image is learned so that the televiewer may notice neither voice nor a picture image. This technique is [********** (steganography) and] information hiding (Information Hiding). It is called. In recent years, since it is used also for protecting a copyright by embedding a copyright person's identifier etc. in voice or a picture image, it is called "digital watermarking." By development of the regeneration recording device of a digital signal in recent years, since the quality did not deteriorate even if it copies the voice picture signal broadcast or recorded as a digital signal, a possibility of an unjust copy having been performed and infringing on a copyright became strong. For this reason, in order to aim at copyright protection, it considers preventing an unjust copy by embedding data, such as a copyright person name, into a digital signal into a digital signal.
[0003] Since this invention is for preventing the unjust copy for protection of a copyright, below, it is called digital-watermarking coding to embed data in voice or a picture image, and it calls it digital-watermarking decryption to take out the data embedded from the voice where data were embedded, or the picture image.
[0004] In addition, about the digital-watermarking coding technique and the digital-watermarking decryption technique, Kineo Matsui work "the picture signal encryption-technique and an application" (woods Kitade version 1993) etc. has a detailed explanation, for example.
[0005] Moreover, there is technique given [as technique] in JP,5-236424,A which prevents embedding digital watermarking into a video signal and being copied unjustly. This technique has proposed the displacement or embedding data into a video signal without processing as it is for the field of the shape of an impression which shows a low value the field which upheaved more than the set point in the video signal compared with the neighboring signal value, or more than the set point to other signals as a characteristic feature fraction of a video signal.
[0006]
[Problem(s) to be Solved by the Invention] In protection of the copyright by the conventional digital watermarking, there was a problem on which protection of a copyright is not fully performed.
[0007] First, by unjust copy, people who are going to get profits call the medium by which the unjust copy was generally carried out that by which the unjust copy was carried out, do not sell it, but pretend that it is a regular copy and sell. For this reason, when "the identifier of the copyright person embedded by digital watermarking at the voice picture signal" and "a copyright person's identifier currently written to the package of a medium by which the unjust copy was carried out" are in agreement, as for the material for judging, the copy does not become [whether "a copyright person's identifier embedded by digital watermarking" is an unjust copy, and]. Rather, the common consumer who does not know the principle of digital watermarking looks at packing of a medium, and he will be sure that it is a genuine article, if he reproduces a voice picture signal from the medium and the identifier of "the copyright person embedded by digital watermarking at the voice picture signal" is seen, even if he suspects that it may be a pirate edition. In this case, it may become the opposite effect for digital watermarking's protecting a copyright.
[0008] Next, in exchanging an unjust copy in between [, such as a friend or a family,], a parvus problem has possibility that the fact which is carrying out the unjust copy will be known by the third person. And it can consider that the number of cases of an unjust copy increases as a copy becomes easy in connection with the spread of mass digital formula voice image-reconstruction recording devices, since the consciousness of carrying out the unjust copy is thin. and in the case of a digital formula voice image-reconstruction recording device, since a signal does not deteriorate even if it copies, an unjust copy piles up one after another -- having -- ** -- an unjust copy is performed broadly and it can consider that an inaccurate duplication is distributed so that it may say
[0009] Moreover, although there is a place when it was excellent in the point which embeds data into a video signal without being visually accompanied by degradation of a picture fraction with the technique given in JP,5-236424,A mentioned as conventional technique, there is a dislike from which the processing and configuration become complicated in that the characteristic feature field of a picture image is extracted and the signal of the fraction is changed.
[0010] this invention aims at offering the unjust copy prevention technique and equipment which inhibit an unjust copy by only embedding into data digital watermarking which enlarges the cost of an unjust copy in view of an above-mentioned problem rather than embedding a copyright information by digital watermarking, and giving random nature to the data.
[0011]
[Means for Solving the Problem] The first viewpoint of this invention is characterized by embedding the noise which is the grade which a degradation of tone quality or quality of image can hardly recognize at a televiewer to the sound signal or picture signal reproduced about the unjust copy prevention technique as digital watermarking.
[0012] Moreover, it is characterized by equipping the second viewpoint of this invention with a digital-watermarking coding means

to embed and output the noise which the decode means of a sound signal or a picture signal, a noise occurrence means, and the aforementioned noise occurrence means output about an unjust copy arrester as digital watermarking to the sound signal or picture signal which the aforementioned decode means outputs.

[0013] This unjust copy arrester is made to carry out regeneration record of the voice picture signal where the noise was embedded, when it is prepared in the regeneration recording device of a voice picture image and a voice picture signal is outputted, or when recording a voice picture signal.

[0014] Since according to the technique and equipment of this invention a degradation of tone quality or quality of image can hardly be recognized even if it views and listens to the voice picture signal reproduced from the copy medium of a regular copyright, a problem does not arise to a televiewer. However, since the noise is added to the voice picture signal whenever it is reproduced or copied when it views and listens to the medium copied unjustly, a degradation of tone quality or quality of image becomes large. For this reason, even if it reproduces the medium copied unjustly, the voice picture image where a tolerance limit is exceeded and the noise was embedded cannot bear viewing and listening, and inhibits an unjust copy.

[0015] Moreover, since the amount of data of the part of the noise embedded by embedding a noise increases, if it copies unjustly using a voice picture signal regeneration recording device, the data by which the unjust copy was carried out will become longer than the original data. For this reason, if so long that the length of the original data can record on the medium whose number is one barely, in order to record the data by which the unjust copy was carried out, the medium of two sheets will be needed, and the cost of an unjust copy will increase, and this will inhibit the unjust copy action.

[0016] Moreover, the third viewpoint of this invention embeds the unjust copy prevention control signal at the voice picture signal. It is the technique of choosing a regeneration output by the case where there is nothing with the case where there is an unjust copy prevention control signal at the time of regeneration. The unjust copy prevention control signal which directs to embed a noise as digital watermarking at the time of regeneration record of a voice picture signal is embedded at the aforementioned sound signal or a picture signal. When an unjust copy prevention control signal is detected out of the sound signal which decoded at the time of regeneration record of a voice picture signal, or a picture signal and the aforementioned unjust copy prevention control signal is detected At the time of regeneration record, it is characterized by embedding the noise which is the grade which a degradation of tone quality or quality of image can hardly recognize to a voice picture signal at a televiewer as digital watermarking.

[0017] Moreover, a decryption means for the fourth viewpoint of this invention to start invention of equipment, and to extract the unjust copy prevention control signal which directs to embed a noise as digital watermarking at the time of regeneration record from the inputted voice picture signal, A comparison means to compare the unjust copy prevention control signal beforehand given the unjust copy prevention control signal extracted with this decryption means, and self-equipment, The digital-watermarking coding means which embeds the noise which the aforementioned noise occurrence means outputs to the voice picture signal inputted as the noise occurrence means as digital watermarking of the grade a televiewer cannot recognize a degradation of the voice picture signal to be, It is characterized by having a selection means to output the output of the aforementioned digital-watermarking coding means when the aforementioned comparison means detects a correspondence of an unjust copy prevention control signal, and to output the inputted voice picture signal when an inequality is detected.

[0018] In addition, a voice picture signal regeneration recording device can be equipped with this unjust copy arrester, an unjust copy prevention control signal can be set up in the type which a user cannot change into a device beforehand, and the sound signal or picture signal where the unjust copy prevention control signal was beforehand embedded as digital watermarking can be inputted.

[0019] It embeds at the voice picture signal, using as an unjust copy prevention control signal whether to operate a copy prevention function, and controls by invention of these the third and fourth viewpoints whether the copy prevention function in a regeneration recording device is operated. Since processing which embeds a noise further is performed when the unjust copy prevention control signal for inhibiting a copy is embedded at the voice picture signal, a degradation of tone quality or quality of image becomes large at the grade sensed by the televiewer as the regeneration output, and it can recognize that the original voice picture signal is an unjust copy. When a degradation of tone quality or quality of image becomes large at the grade sensed by the televiewer by embedding a noise in a loan at the time of a regular copy, a degradation of tone quality or quality of image can be prevented by interrupting embedding or addition of an unjust copy control signal.

[0020]

[Embodiments of the Invention] Hereafter, with reference to a drawing, one example of the gestalt of operation of this invention is shown.

[0021] Drawing 1 is a block diagram showing the basic configuration of the unjust copy arrester of the first example of this invention.

[0022] This equipment is equipped with the noise generator 101 which generates a noise, and the digital-watermarking coding equipment 102 which embeds as digital watermarking at the voice picture signal to which the generated noise is supplied from an input terminal 103, and is outputted from an output terminal 104. The noise source known with a random number generator or other sufficient white-noise generators is used for the noise generator 101. Moreover, the digital-watermarking coding equipment which embeds digital watermarking into the data with which the digital-watermarking coding equipment 102 is also used from the former is used. In addition, the size (amplitude) of the noise which the size of a noise is decided beforehand and embedded is the thing of the grade a televiewer cannot recognize a degradation of tone quality or quality of image to be. This unjust copy arrester is prepared in a sound system, image-reconstruction equipment, a sound-reproduction recording device, or an image-reconstruction recording device. On these specifications, this is named voice image-reconstruction equipment or a voice picture signal regeneration recording device generically.

[0023] Prevention or suppression of an unjust copy of the voice picture signal by the unjust copy arrester of this next drawing 1 is explained.

[0024] First, the unjust copy arrester beforehand shown in drawing 1 in outputting a voice picture signal from a voice picture signal regenerative apparatus is included in the voice picture signal regenerative apparatus, the reproduced voice picture signal is supplied to an input terminal 103, and the voice picture signal which embeds the noise which is the grade which a televiewer cannot recognize to the reproduced voice picture signal, and is outputted from an output terminal 104 is outputted outside. Moreover, in copying a voice picture signal inside a voice picture signal regeneration recording device (record), it builds this equipment into the voice picture signal regeneration recording device beforehand, and the reproduced voice picture signal is supplied to an input terminal 103, and the signal which embeds at the voice picture signal which had the noise of the grade a televiewer cannot recognize a degradation of tone quality or quality of image to be reproduced, outputs from an output terminal

104, and was outputted to this output terminal 104 is copied (record).
[0025] Thereby, the noise which is the grade a televiewer cannot recognize a degradation of tone quality or quality of image to be is embedded by the output terminal 104 at a regeneration voice picture signal, and is outputted to it. A television machine, picture-recording equipment, etc. are connected to this output terminal 104. In viewing and listening to the output of this output terminal 104 as it is, a televiewer does not feel inconvenience. However, since a noise will be further superimposed on a voice picture signal when it is going to copy the output of this output terminal 104 unjustly, tone quality and quality of image deteriorate further, and the advantage which becomes unable to bear to viewing and listening of a televiewer, and performs an unjust copy is lost.
[0026] Next, the second example is explained with reference to drawing 2 . Drawing 2 is a functional block diagram showing the basic configuration of the second example. This second example controls the copy prevention function of a voice image-reconstruction recording device using an unjust copy prevention control signal.
[0027] This unjust copy arrester is what is incorporated in a voice image-reconstruction recording device. The digital-watermarking decryption equipment 201 which extracts the unjust copy prevention control signal which directs to embed a noise as digital watermarking at the time of regeneration record from the voice picture signal inputted from the input terminal 103, The comparator 202 as a comparison means to compare the unjust copy prevention control signal beforehand given the unjust copy prevention control signal extracted with this digital-watermarking decryption equipment 201, and self-equipment, and the noise generator 101 as a noise occurrence means, The digital-watermarking coding equipment 102 as a digital-watermarking coding means embedded at the voice picture signal into which the noise which the noise generator 101 outputs was inputted as digital watermarking of the noise of the grade a televiewer cannot recognize a degradation of the voice picture signal to be, When the aforementioned comparator 202 detects a correspondence of an unjust copy prevention control signal, the output of the aforementioned digital-watermarking coding equipment 102 is outputted to an output terminal 104, and when an inequality is detected, it has the selector 203 as a selection means to output the voice picture signal inputted into the input terminal 103.
[0028] An operation of the equipment of the second example is explained.
[0029] The digital-watermarking decryption equipment 201 restores digital watermarking contained in the voice picture signal supplied from an input terminal 103, and supplies restored digital watermarking to a comparator 202. A comparator 202 compares the unjust copy prevention control signal and digital watermarking which are supplied to an input terminal 204, and outputs a comparison result. If the unjust copy prevention control signal and unjust copy prevention control signal which were extracted as digital watermarking are in agreement, it is referred to as 1, and it will be referred to as 0 if not in agreement. The noise generator 101 generates a noise and supplies the generated noise to the digital-watermarking coding equipment 102. The digital-watermarking coding equipment 102 makes a noise digital watermarking, and embeds and outputs it to the voice picture signal supplied from an input terminal 103 on the level which is the grade which cannot recognize a degradation of tone quality or quality of image to a televiewer. A selector 203 will choose and output the output of the digital-watermarking sign equipment 102, if the output of a comparator 202 becomes one (when the unjust copy prevention control signal and the unjust copy prevention control signal of an input terminal 204 which were extracted from digital watermarking are in agreement). On the other hand, a selector 203 chooses the voice picture signal supplied from an input terminal 103 if the output of a comparator 202 becomes zero, it outputs, and the output of a selector 203 is outputted from an output terminal 104.
[0030] In addition, digital watermarking used in the digital-watermarking decryption equipment 201, digital watermarking used in the digital-watermarking coding equipment 102, and the digital-watermarking coding equipment 102 have the desirable thing of another method. In being the same method, when performing coding processing of digital watermarking, another parameter which can discriminate a noise and an unjust copy prevention control signal shall be used. This avoids that an unjust copy prevention control signal and a noise interfere. Moreover, thereby, an unjust copy prevention control signal can be extracted from the voice picture signal where the noise was embedded.
[0031] Prevention of an unjust copy of the voice picture signal by the unjust copy arrester shown in drawing 2 is explained.
[0032] First, the unjust copy prevention control signal for preventing an unjust copy beforehand is decided. The picture image which consists of character strings, such as "copy prevention functional ON", is sufficient as this, and a bar code is sufficient as it, and it could be encoded by the other coding technique. And the manufacturer of a voice picture signal regeneration recording device records the unjust copy prevention control signal on the voice picture signal regeneration recording device. In addition, it shall be recorded on a device that an unjust copy prevention control signal cannot be changed into a common user. Moreover, the manufacturing-and-selling person who wants to prevent that the medium is copied by the manufacturing-and-selling person of the medium by which voice picture signals, such as a movie, were recorded embeds the unjust copy prevention control signal by digital-watermarking coding beforehand at the voice picture signal on which the medium is recorded. In addition, the digital-watermarking coding technique of this unjust copy prevention control signal shall be the digital-watermarking coding technique corresponding to the digital-watermarking decryption equipment 201.
[0033] In the first example, since the noise was embedded to all voice picture signals, although there was a problem that a noise was embedded also to the voice picture signal which the user created uniquely, since a noise is embedded in the second example only to the voice picture signal where the unjust copy prevention control signal is embedded, a noise is not embedded to the voice picture signal which the user created uniquely.
[0034] In addition, in the case of an analog signal, although reference was not made in an explanation of the above example [first] and the second example about whether a voice picture signal is an analog signal, or it is a digital signal, since what is necessary is just to use digital watermarking corresponding to a digital signal using digital watermarking corresponding to an analog signal in the case of a digital signal, a voice picture signal can carry out also with an analog signal or a digital signal. Moreover, although explained by embedding only an unjust copy prevention control signal, as another control signal, the output-power control signal of a noise generator may be embedded, and the power of the noise which a noise generator outputs may be controlled by the second example.
[0035]
[Effect of the Invention] There are the following effects in this invention.
[0036] First, the medium by which the unjust copy was carried out can prevent that an unjust copy is carried out further in the first place. It is because a noise will accumulate, tone quality and quality of image will deteriorate greatly, it will become impossible that it is equal to a televiewer's admiration and the value as goods will be lost, if an unjust copy is carried out repeatedly, since the noise is added to the voice picture signal in this invention whenever it is reproduced or copied.
[0037] the noise is added to the voice picture signal the second -- being also alike -- it does not change, but even if it views and listens to the voice picture signal reproduced from the medium copied regularly, a degradation of tone quality or quality of

image can hardly be recognized Although this is embedding the noise by digital watermarking in this invention at the voice picture signal, digital watermarking is because data are embedded at a voice picture signal so that it may be hard to recognize to the televiewer of a voice picture signal.

[0038] Moreover, when it views and listens to the voice picture signal reproduced by the third from the medium by which the unjust copy was carried out in this invention, a degradation of tone quality or quality of image is large. It is because a degradation of a picture image will be conversely recognized strongly if a tolerance limit is exceeded since it is also a fraction important for human being recognizing voice and a picture image into such a fraction although a low frequency signal is embedded into a fraction flat in embedding a RF signal at a border-line fraction in the case of a picture image so that this may seldom generally recognize digital watermarking to a televiewer, data (noise) are embedded and a picture signal deforms greatly. Moreover, even if it is difficult to remove this embedded noise since it is embedded at random, and it is going to remove from a voice picture signal temporarily, the cost for it becomes large.

[0039] Moreover, there is an effect increased to the fourth by the cost of an unjust copy in the digital voice picture signal regeneration recording device which is compressing and recording the voice picture signal in this invention by the data compression coding technique of variable length of changing the length of a sign according to the redundancy of a signal sequence. This is because the data by which the unjust copy was carried out will become longer than the original data if an unjust copy is performed using a digital voice picture signal regeneration recording device, since only the part of the noise where the amount of data of the sign which carries out the data compression of the voice picture signal, and is obtained was embedded will become long, if a noise is embedded by digital watermarking at a voice picture signal. If there is a long potato so that the length of the original data can record on the medium whose number is one barely, since the medium of two sheets is needed for recording the data by which the unjust copy was carried out, the cost of an unjust copy increases. Moreover, it is effective in sale of an inaccurate duplication becoming it difficult that it is an unjust copy by mental fatigue or the cone's if no less than two sheets have the medium whose number must usually be one even if it deceives the medium by which the unjust copy was carried out as a regular copy and it sells it. Of course, although this invention does not prevent copying a medium physically, without using a regular digital voice picture signal regeneration recording device, and manufacturing and selling an inaccurate duplication When a special reproducing unit is manufactured and an inaccurate duplication is manufactured Since it must sell on a large scale in order to collect manufacturing costs, it is detected by the probability with high manufacturing and selling the inaccurate duplication, and possibility of being punished becomes high and is also inhibiting such a physical unjust copy.

[0040] Moreover, even if it is copied to the fifth by other mediums by which a record format is different in this invention, the effect of unjust copy prevention does not disappear. It is because an effect does not disappear even if digital watermarking is generally copied to other different mediums of a record format by this. For this reason, if this invention is applied to the video signal by which television broadcasting is carried out, even if the unjust copy of the video signal is carried out, there is no possibility that an unjust copy may be carried out without any restriction. Moreover, even if a common user is going to record the voice picture signal reproduced by the digital voice picture signal regeneration recording device on the existing analog formula video tape recorder (VTR) without a copy prevention function, is going to record the voice picture signal reproduced with VTR by the digital voice picture signal regeneration recording device and is going to cancel an unjust copy prevention function, the unjust copy prevention function of this invention cannot be canceled. Of course, if a digital voice picture signal regeneration recording device spreads although an unjust copy cannot be prevented when a voice picture signal is recorded on the video tape recorder (VTR) of the existing analog formula without a copy prevention function and the unjust copy of the tape of VTR is carried out, use of analog formula VTR will decrease and such unjust copy action will decrease.

[0041] Moreover, this invention has [whether the unjust copy prevention function of a voice picture signal regeneration recording device is operated, and] an easily controllable effect in the sixth. Since this is determined by whether the unjust copy prevention control signal is embedded by digital watermarking at the original voice picture signal, has it operated the unjust copy prevention function of this invention or not? For this reason, when a degradation of tone quality or quality of image should become large to the extent that it is sensed by the televiewer by this invention, a degradation of tone quality or quality of image can be suppressed by interrupting embedding of a copy prevention control signal. Moreover, tone quality is able to embed the information for also adjusting the size of a noise as a control signal, if required, and to adjust quality of image.

[Translation done.]